

Please add claims 69-89 as follows:

- - 69. An apparatus for processing a biopharmaceutical product comprising:

a vessel adapted to receive a medium comprising a biopharmaceutical product, said vessel comprising an interior wall defining an interior cavity, said interior wall adapted to be actively cooled using a fluid; and

a heat exchange structure having one or more heat transfer members positioned within said cavity, wherein one or more of said heat transfer members allow a thermal bridge to be formed by said medium in a gap between said heat transfer members and said interior wall wherein heat is transferred from said heat transfer member through said thermal bridge to said interior wall in response to said interior wall being actively cooled.

70. The apparatus of claim 69, wherein said heat exchange structure comprises a dual flow conduit.

71. The apparatus of claim 70, wherein said dual flow conduit comprises a core member defining an interior passage adapted to receive a fluid and an outer member spaced from the core member and defining an outer passage with the core member, the inner and outer passages in fluid communication with each other to define a fluid flow path for a fluid.

72. The apparatus of claim 71, wherein fluid flows down the interior passage and up the outer passage.

73. The apparatus of claim 71, wherein said outer member comprises an end piece adapted to receive the fluid flowing through the interior passage defined by said core member.

101 74. The apparatus of claim 73, wherein said end piece includes a heat exchange member.


75. The apparatus of claim 74, wherein said heat transfer member of said end piece allows a thermal bridge to be formed by said medium between the heat transfer member of said end piece and said interior wall wherein heat is transferred from said heat transfer member of said end piece through said thermal bridge to said interior wall

76. The apparatus of claim 69, wherein said heat transfer members are fins.

77. The apparatus of claim 71, wherein said heat transfer members extend radially from said outer member.

78. The apparatus of claim 71, wherein heat is transferred from said one or more of said heat transfer members through said outer member when fluid flows in the outer passage.

79. The apparatus of claim 71, wherein the core member and the outer member are tubular.



80. The apparatus of claim 69, wherein said vessel comprises a jacket spaced from an exterior wall of said vessel to define a fluid flow path adapted to receive fluid to actively cool said interior wall.

81. The apparatus of claim 80, wherein baffles are positioned within the fluid flow path between the jacket and the exterior wall of said vessel to define a spiraling path for fluid.


82. The apparatus of claim 69, wherein said heat exchange structure is removeable from said vessel.

83. The apparatus of claim 69, wherein said interior wall comprises one or more heat transfer members extending towards said structure.

84. The apparatus of claim 83, wherein said one or more heat transfer members of said interior wall allow a thermal bridge to be formed by said medium between said one or more heat transfer members of said interior wall and said one or more heat transfer members of said heat exchange structure wherein heat is transferred from said heat transfer member of said heat exchange structure through said thermal bridge to said heat transfer

member of said interior wall when said interior wall is actively cooled.

85. The apparatus of claim 69, wherein the heat exchange structure comprises a plurality of heat transfer members, said plurality of heat transfer members being configured within said interior cavity to form freezing compartments.



86. The apparatus of claim 85, wherein said freezing compartments are formed between adjacent heat transfer members and said interior wall.

87. The apparatus of claim 69, wherein said heat exchange structure comprises a pipe being positioned in the center of said interior cavity, said heat transfer members extend radially from said pipe.

88. A method of processing a biopharmaceutical product comprising:

providing a vessel adapted to receive a medium comprising a biopharmaceutical product therein, said vessel having an interior cavity defined by an interior wall of said vessel and a heat exchange structure within said cavity, said heat exchange structure having one or more heat transfer members;

placing a medium comprising a biopharmaceutical product within said vessel;